



Sharing supply chains: lessons from an exemplary case

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CONCEPTUALIZING SHARING SUPPLY CHAINS - LESSONS FROM AN EXEMPLARY CASE

Structured Abstract

Purpose

Over the last decade, a “new” sharing economy has emerged. So far, the supply chain literature has focused on platforms delivering crowd-logistics services that connect businesses and consumers (B2C). It has paid little attention to platforms that facilitate products exchanges between consumers. This article aims to develop a first supply chain conceptualization for C2C product exchanges stimulated by the sharing economy. How can we conceptualize them from an SC perspective? Do such C2C product exchanges form what we might call “sharing supply chains”? What are the characteristics of these sharing supply chains?

Design/methodology/approach

We rely on a single case study of Vestiaire Collective (VC), a C2C platform that links consumers buying and selling secondhand luxury goods. This case was not selected because it is a typical C2C product platform, but because it is an "extreme" case (Yin, 2014) meeting Siggelkow's "talking pig" criterion (2007).

Findings

We demonstrate that VC intermediates a “sharing supply chain”, whose features differ from forward and reverse supply chains. We stress that strong physical intermediation is crucial in this extreme case. We then contrast this extreme case with other forms of sharing supply chains to identify the variables leading to these alternative configurations. Finally, we develop theoretical propositions regarding the physical intermediation role that these platforms may play.

Originality/value

Our article extends the scope of the supply chain concept by identifying sharing supply chains alongside other types of chains. It also points to the strategic role of SC dimensions in the sharing economy. We hope that it will lead to further research on sharing supply chains.

Keywords: consumer, case study, supply chain, peer-to-peer, sharing economy

Recent years have seen the rise of a new “sharing economy”. This concept refers to the development of collaborative exchanges between individuals or between individuals and businesses, following a non-market (donations, loans, etc.) or a market logic (Schor, 2016). Its claimed objective is to favor *access* to goods rather than ownership (Botsman and Rogers, 2010) and to promote the sharing of goods and services between peers (Belk, 2014). This economy mostly relies on platforms (Andersson *et al.*, 2013) that facilitate the development of collaborative exchanges. These platforms, the most famous of which are Airbnb and Uber, have two key features. They act as digital intermediaries (Langley and Leyshon, 2017) and address two groups of players (Rochet and Tirole, 2006), multiplying the possibilities for mutual exchanges.

The literature has clearly highlighted the internal diversity, complexity and contradictions of the sharing economy, reflecting a variety of organizational forms and business models (Botsman and Rogers 2010, Acquier *et al.*, 2019). Within the sharing economy, some platforms facilitate consumer-to-consumer exchanges of goods (C2C product exchanges). They enable “social strangers” (Belk, 2014) to swap, sell, rent, or lend goods to each other, thus amplifying the scale of the physical exchanges between individuals that have always existed in human society (Carbone *et al.*, 2018). As pointed out by Plouffe (2007), they operate outside the realm of traditional channels and value chains. These C2C product platforms have been widely studied in the marketing, strategic management and economic literature, with an emphasis on the marketing techniques that drive platform performance (Shang *et al.*, 2017 or Chen *et al.*, 2018), the trust building and matchmaking role they play (Chen *et al.*, 2019; Jia *et al.*, 2020), and other dimensions leading to economic efficiency (Wang *et al.*, 2020; Tian *et al.*, 2021). Still, they have been insufficiently studied from a supply chain perspective. This gap is of concern (Lange and Pfarrer, 2017) for two reasons. First, from a societal perspective, C2C product exchanges are a key component of redistribution markets, which may

help the development of a circular economy where resources and energy are cycled in a closed loop (Ghisellini *et al.*, 2016). As a circular economy is theoretically consistent with the condition of living in a finite world with planetary boundaries (Buchmann-Duck and Beazley, 2020), understanding the characteristics of supply chains associated with these C2C product exchanges is crucial, notably to identify the many trade-offs and tensions that may arise in the different stages of any product life cycle (Peña *et al.*, 2020). Second, from an operational perspective, C2C product platforms give a central place to consumers, who are both the suppliers and the final customers of the exchanged products. This particular configuration, emphasized by the consumer logistics literature (Granzin and Bahn, 1989), means that supply chains for C2C product exchanges will have certain specificities, which require dedicated operational models.

This article focuses on the supply chains engendered by C2C product exchanges and designed by C2C product platforms, in the broader context of the sharing economy. Do such C2C product exchanges form what we might call “sharing supply chains”? If so, what are their distinctive characteristics? Do they differ from traditional forward and reverse supply chains? We explore a single case, that of Vestiaire Collective (VC), a C2C product platform that links consumers buying and selling secondhand luxury goods. We have selected this case because it is an "extreme" case (Yin, 2014), meeting Siggelkow's "talking pig" criterion (2007), and is suitable for an inductive approach leading to theory generation (Ketokivi and Choi, 2014). VC leads the global secondhand clothes market alongside Vinted (which mostly deals with entry-level/mid-range products). VC not only acts as a digital intermediary, but also as a physical intermediary that routes its secondhand luxury product flows through its own warehouses, and undertakes specific operations to ensure product quality and authenticity. This case illustrates the most complex form of C2C product exchanges as VC's physical flows are worldwide, sophisticated, and concern high-value items.

This article's contribution is twofold. First, we identify a new type of supply chain that the literature has not yet conceptualized: the sharing supply chain. Until now, the literature has focused on forward (Stevens, 1989) and reverse supply chains (Stock, 1992), sometimes interconnected as closed-loop supply chains (Guide *et al.*, 2003). By conceptualizing and characterizing C2C supply chains, our research extends the scope of the supply chain concept and contributes to the development of supply chain theory (Carter *et al.*, 2015; Flynn *et al.*, 2020). Our study also suggests that, notwithstanding the focus in the literature on informational intermediation (Cachon *et al.*, 2017) and digital trust (Möhlmann 2016), determining the right amount of physical intermediation can be a key success factor for C2C product platforms.

The paper is organized as follows. First, we show that the sharing economy literature has neglected to study supply chain dimensions underpinning C2C product exchanges. Then we present our methodology, based on a single case study. In the following section we show how VC has built up a successful model based on strong physical intermediation. In the discussion, we demonstrate that VC intermediates a “sharing supply chain”, differing from other better-known types of chains. We also compare this extreme case with other modes of intermediation, highlighting how each of them applies to different contexts/products and introduce theoretical propositions regarding the factors influencing the intermediation carried out by the platform. To conclude, we present the limitations of our study and identify several research avenues.

SHARING ECONOMY LITERATURE: HIGHLIGHTS FROM A SUPPLY CHAIN PERSPECTIVE

Recent decades have seen a spectacular increase in initiatives facilitating resource sharing by firms and individuals in the form of exchange, rental, or donation (Botsman and Rogers, 2010). This phenomenon, amplified by the growing connectivity enabled by digital technologies (Sundararajan, 2016), has been labelled the sharing economy.

The sharing economy: different purposes, diverse organizations

The sharing economy is a novel academic field that has attracted scholars in sociology (Schor, 2016), organizational studies (Mair and Reischauer, 2017), consumer marketing (Belk, 2014), strategic management (Cohen and Kietzmann, 2014), supply-chain (Carbone *et al.*, 2017) and operations management (Benjaafar and Hu, 2020). The sharing economy covers a wide range of organizational forms, from for-profit to non-market initiatives (Schor, 2016). It includes different multi-stakeholder configurations, and both B2C initiatives (Acquier and Carbone, 2018) and C2C (or peer-to-peer) initiatives. It is described as a hybrid economy (Scaraboto, 2015) dominated by exchanges between individuals, with organizations acting as intermediaries. Definitional debates are rife in the field, questioning its boundaries and related terminology (Frenken and Schor, 2019). Botsman and Rogers' pioneering work (2010) divides sharing economy initiatives into three distinct categories. The “community economy” develops the capacity of individuals by bringing them together “in a crowd” (e.g., crowd funding). “Product/service systems” allow consumers to switch from ownership to access or use of goods (e.g., car sharing). Finally, “redistribution markets” allow individuals to buy, sell, recycle, give, and share (e.g., eBay). Similarly, Acquier *et al.* (2017) identify three sharing economy “worlds”, labeling them as community, access, and platform economies.

C2C product platforms in the sharing economy

The sharing economy has thus witnessed the emergence of what we propose here to call “C2C product platforms”. Such initiatives, which can be conceptualized as a “redistribution market” (Botsman and Rogers, 2010), present two distinctive features in the sharing economy. First, their aim is to facilitate transactions between individual consumers. Second, even though they may offer consumers additional services, their value proposition is centered on physical exchanges of products (mostly secondhand ones or self-made craft products), and not on the delivery of a service, as in the case of platforms such as Uber, BlablaCar, and AirBnB.

Successful C2C product platforms include eBay, Etsy, VC, and Vinted. The literature on such initiatives is important but quite oriented toward transaction and consumer related dimensions.

Research on C2C product exchanges: focus on marketing, economic and operational efficiency

One stream of research on C2C product exchanges (often referred to as “product-sharing”) has focused on the interface between consumer behavior and the platform's marketing and distribution strategies. Scholars have analyzed consumer valuation of free product returns (Shang *et al.*, 2017), the seller's online listing strategy (Chen *et al.*, 2018), and the impact of product photographs and reputation systems on consumer behavior and product cost (Van Der Heide *et al.*, 2013). Others have looked into the retailer's share of the gross profit margin in the channel linked to product sharing (Tian and Jiang, 2018). A second stream, mainly based on analytical models, investigates the optimal economic and operational conditions leading to successful operations in this field. Tian *et al.* (2021) elaborate a game-theory model to see when a manufacturer could benefit from entering product sharing exchanges. Authors analyze how manufacturers should penetrate product sharing markets (Tian *et al.*, 2021), either by building their own platform or by joining existing ones (Zhang *et al.*, 2021). How these C2C product exchanges affect manufacturers’ quality (Wang *et al.*, 2020) ; their profits, consumer surplus, or social welfare (Jiang and Tian, 2018) has been also investigated. All in all, this literature stream highlights firms’ operational decisions from cost and value perspectives, but it shows a real lack of interest in how these exchanges are physically organized. This is quite surprising, as earlier research demonstrated that physical distance is a very important dimension in this context (Hortaçsu *et al.*, 2009). Drawing on Botsman and Rogers’ (2010) typology mentioned above, we turn to complementary literature in the sharing economy field. We read the "community economy" and

"product/service systems" streams from a supply chain perspective to assess to what extent they offer interesting insights for "redistribution markets" (here C2C product exchanges).

Research on crowd-logistics: optimization and categorization

In the business world, the "community" dimension of the sharing economy is often materialized in initiatives which mobilize crowds of individuals to perform tasks previously undertaken by companies. Crowd-logistics refers to logistics services that tap into the logistics resources and capabilities of individuals, using mobile applications and web-based platforms (Carbone *et al.*, 2017). Most of the research in this literature focuses on the optimization of matching or geo-localization algorithms, and elaborates models to enhance the logistics performance of the crowd, especially in last-mile delivery (Saglietto, 2021). Other articles provide a comprehensive analysis of crowd-logistics business models (e.g. Mladenow *et al.*, 2016; Carbone *et al.*, 2017; Frehe *et al.*, 2017; Rai *et al.*, 2017; Ta *et al.*, 2018; Ciobotaru and Chankov 2021). For instance, Mladenow *et al.* (2016) differentiate between variants of crowd logistics in terms of their flow of materials, goods and information. Carbone *et al.* (2017) characterize four types of "crowd-logistics" services: storage, local delivery, freight forwarding, and freight transport. To sum up, crowd-logistics literature mainly focuses on flow identification, organization and optimization.

The Product Service System literature: towards a supply chain orientation

The value proposition of product service systems (PSS) relies on final user involvement rather than on the product attributes themselves (Baines *et al.*, 2007). SC issues have not been a central focus in PSS literature until recent years, as shown by a systematic review (Annarelli *et al.*, 2016), which identifies only five papers on this topic. Some authors mention that a PSS requires close co-operation between the main producer and its suppliers, service producers and final consumers (Mont, 2002), thus implying the need for integrated chain management. A more recent review (Xu *et al.*, 2020) similarly points out that a PSS depends

heavily on “cooperation, collaboration and integration” principles (p.1) and requires value co-creation among supply chain members. Other scholars (Salminen and Kalliokoski, 2008; Baines *et al.*, 2011) identify the different members that make up a PSS chain: the original equipment manufacturer, its partners (solution provider, maintenance partners, performance and value partners), the users and society, as PSS chains are supposed to deliver more sustainable solutions (Annarelli *et al.*, 2016). These actors are supposed to be closely coordinated, which does not sound much different from manufacturing supply chains. More specifically, Xu *et al.* (2014) propose a definition of the PSS supply chain around three levels: the customer, i.e. the receiver of the PSS, various service providers, and the supplier involved in PSS development. They also point to four features (value co-creation, activeness, uncertainty and dynamics) “forming the basis for an effective supply chain management of PSS” (p.1650). All in all, PSS literature defines the supply chains traced by these product-service bundle flows, identifies their different members and highlights their necessary cooperation, recalling the concept of supply chain orientation (Mentzer *et al.*, 2001).

C2C product platforms through a supply chain lens

The above-mentioned literature tells us several things about the supply chain perspective in the sharing economy. On the one hand, it shows that these chains implicitly share certain characteristics and goals with traditional chains. They are composed of several different actors (cf. PSS), they are clearly seeking flow optimization (cf. crowd-logistics) and better cooperation (both). While these results are interesting and might be transferable, C2C product platforms present some important differences with crowd-logistics and PSS. On the one hand, crowd-logistics by definition offers logistics services, while our focus is on product exchanges. PSS, on the other hand, is defined as a marketable set of products and services provided by a single company or an alliance of several companies (Goedkoop *et al.*, 1999), while our focus is on exchanges between consumers which clearly modify the studied network. Moreover, PSSs use

existing industrial and commercial structures (Evans *et al.*, 2007) while C2C exchanges mainly rely on new platforms. Finally, PSS chains provide customers with access to products that continue to be owned by an organization (Hazéeet *al.*, 2020) while C2C operations include the transfer of ownership from one customer to another. Supply chains for C2C product platforms thus need to be further studied to gain a more refined understanding of their distinctive mechanisms and improve both their operational performance and societal impact.

RESEARCH DESIGN

Our aim is therefore to develop a supply chain oriented conceptualization of C2C product exchanges engendered by the sharing economy. To address our research questions, we decided to investigate C2C product platforms using a single case study protocol, as this method is appropriate for research aimed at theory building (Voss *et al.*, 2002; Barratt *et al.*, 2011).

Theory generation from case studies

As pointed out by Ketokivi and Choi (2014), case studies can assist both theory elaboration and theory generation. “Theory generation” aims to develop new theory by induction from one or more case studies, which is appropriate when the research context is “novel and unfamiliar” and when “selecting an *a priori* theory through which the question is examined may create undue bias toward being theoretically conservative” (Ketokivi and Choi, 2014, p. 234). “Theory elaboration” consists in developing a framework by comparing a theory abductively with case studies (Dubois and Gadde, 2002). This approach is appropriate when a theory is available, but has not yet been applied to the empirical context. Understandably, our research follows the “theory generation” approach. Indeed, C2C product platforms represent a “novel and unfamiliar” SCM context, and no specific SCM theory was *a priori* superior here to orient our empirical observations. According to Ketokivi and Choi (2014), this approach – deriving

explanation (theory) from exploration (analysis) – can generate theoretical propositions for subsequent testing.

The choice of one “extreme” case study

In case study research, it may be useful to investigate several cases, which enables inter-case comparison and improves external validity (Eisenhardt, 1989). However, a single case allows one to go beneath the surface and develop an in-depth analysis (Voss *et al.*, 2002). This approach is appropriate for “new, exploratory investigations” (Meredith, 1998, p. 451), and may lead to stimulating results as “major discoveries have often resulted from single observations” (McCutcheon and Meredith, 1993, p. 247). In this research, we opted to study a single case. As our objective is to develop a first supply chain conceptualization for C2C product exchanges stimulated by the sharing economy, exploratory research is needed. When adopting a single case approach, case selection is crucial, the objective being to select a meaningful case that tells the best possible story (Dyer and Wilkins, 1991), rather than being representative of the whole population (Siggelkow, 2007). The case should be particularly revealing: a “talking pig” (Siggelkow, 2007), an “extreme” case (Yin, 2014) that deserves to be analyzed and made known.

Case selection: the VC platform

We decided to study the firm Vestiaire Collective (VC), a marketplace where private individuals can buy and sell secondhand luxury accessories. VC was established in 2009 in France by a team of six including Christian Jorge and Alexandre Cognard, two entrepreneurs with previous experience in full-service e-commerce. The founders soon realized that such a C2C product platform could only succeed if it was able to convince potential buyers that the products posted were both in the stated condition and authentic. To solve this issue, VC would adopt an unusual model for C2C product platforms: not only would they act as a digital intermediary, like most other platforms (eBay, Etsy, Vinted, etc.), but also as a physical

intermediary that would check product quality and authenticity. Thanks to this original business model, the company became profitable by 2014. As a sign of its success, the start-up raised 156 million euros from various investors during the 2009-2020 period and 178 million euros by March 2021. Today, it has around 400 employees, 11 million members around the world, and lists 1 million items made by 5600 luxury brands. To sum up, VC can be considered as a talking pig, an extreme case, for the following two reasons: 1) its commercial success, which has led the platform to become one of the leaders of the global secondhand clothing market; and 2) the strategic place given to operations and supply chain, activities that VC has partially internalized unlike most of its competitors.

Data collection: a longitudinal study of VC

We collected longitudinal data, covering the period between 2015 and 2021. We collected primary data during three rounds of observation in the different warehouses used successively by VC in France: Courbevoie (2012-2015, with a visit in 2015); Paris (2016-2019, with a visit in 2018); and Tourcoing, the current warehouse (with a visit in 2020). We conducted semi-structured interviews with VC's six founders. The interviews, involving at least two of the authors, lasted between 60 and 90 minutes, and were systematically recorded and transcribed. We organized the interviews around four open topics: the role of the interviewees in the VC story (Topic 1), their view of VC's history since its creation (Topic 2), the role of SCM in VC's success (Topic 3), the evolution of SCM at VC since its creation (Topic 4). Additionally, we held a three-hour workshop with the founder who was the Chief Operations Officer. We collected secondary data from VC, such as PowerPoint presentations and examples of quality control inspection processes, and also secondary data from press articles. A Google search combining several keywords – *Vestiaire Collective*, *operations*, *logistics*, and/or *supply chain* – led us to more than 50 articles in the general and business press, and specialized publications (covering start-ups and the fashion industry). Searches on Google Scholar

identified around 20 additional academic articles. Table 1 summarizes the data collected on the VC case.

Observations	Visit to the Courbevoie Warehouse (2015) Visit to the Paris Warehouse (2018) Visit to the Tourcoing Warehouse (2020)
Interviews	Christian Jorge* (CJ) Fanny Moizant Sébastien Fabre Sophie Hersan Henrique Fernandes* (HF) Alexandre Cognard* ¹ (AC)
Internal sources	PowerPoint presentations Quality control processes Historic photos
Press articles	70 articles published in academic, general, and business press, and specialized publications

Table 1. Data collected on VC

Data analysis: a content analysis

We content-analyzed all the data, aiming to draw the most accurate portrait possible of VC as a C2C product exchange platform. Content analysis is applicable in a qualitative context (here, a single case study) and to numerous types of data (Seuring and Gold, 2012). It is also suitable when the data lack structure, are irregular, and may generate ambiguities (Aureli, 2017). This is especially the case here, where we combine data from diverse sources (material from semi-structured interviews, notes taken during warehouse observations, data published internally or in the online press and print media). Concretely, researchers use content analysis to identify categories and dimensions in raw data through subjective and objective interpretation (Manuj and Pohlen, 2012). In this research, we coded manually, as recommended for immersion in emerging phenomena (Thomas, 2006), and gradually identified four

¹ * Founders identified with an asterisk have successively acted as “Head of Operations” so the quotes in the case study section come from the interviews with these three, as our focal issues were SCM processes.

categories which serve to present the case. The first comprises general information about VC and includes key variables (e.g., number of employees, number of members, turnover, etc.). The second category covers marketing aspects and comprises three variables (market coverage, pricing and moderation, offer and services). Supply chain activities are covered in the third and fourth categories, which contain variables specific to internal (product authentication and quality control, packaging, remanufacturing, and developing specific SC knowledge) and external activities (transport, warehouse infrastructure, flow management). For each of these categories, we identified the main developments between 2009 and 2021, grouped in four three-year periods (see Table 2). To ensure reliability, we shared our results with VC's founders, as recommended by Yin (2014). They suggested a few minor corrections and clarified certain points. To improve the internal validity of the research, we triangulated our primary data (Eisenhardt, 1989; Barratt *et al.*, 2011) with the secondary empirical data. Furthermore, we coded the data together, discussing possible different interpretations, through uninterrupted email exchanges and dedicated meetings (three full-day meetings while writing the paper).

	2009-2012	2012-2015	2015- 2018	2018-2021
KEY FIGURES				
Number of employees	6 founders (2009)	30 employees (2013)	180 employees (2015)	400 employees (2021)
Number of members	500 000 (2011)	1.5 million (2013)	4 million (2015)	11 million in 52 countries (2020)
Turnover	€15 million (2012)	€45 million (2014)	€100 million (2016)	> €200 million (2020)
Fundraising	€1.5m (2010) €7.5m (2011)	€15m (2013)	€33m (2015) €58m (2017)	€40m (2019) €59m (2020) €178m (2021)
Product portfolio	3000 luxury articles collected from friends (2009)	300 000 luxury articles by 4000 brands (2013)	400 000 luxury articles by 5200 brands (2017)	1 000 000 luxury articles by 5600 brands (2021)
Flows	400 parcels a day to and from France	800 to 2000 parcels a day within Europe	3000 parcels/day <i>Conciergerie</i> : 10% of total volume	140 000 new items a week in 2021
MARKETING MANAGEMENT				
Market coverage	Launch in France (2009)	Worldwide growth: UK and then Europe (2012)	Worldwide growth: USA (2015)	Worldwide growth: Asia (2018)
Pricing and moderation	Ex-nihilo creation of a secondhand luxury items price guide (info from eBay/other platforms, etc.)	Creation of a pricing algorithm (info from the price guide, range of products)	Production of tutorial for moderation processes	Creation of a process to identify recommended and expert sellers and grant them specific potentialities
Offer: products and services	Launch of website, inbound transport free for the seller	Focus on 800 brands to optimize the conversion rate	Development of VIP service: <i>conciergerie</i>	Possibility for trusted sellers to ship items costing less than 1000 euros (250 in 2021) directly to the buyer
INTERNAL SUPPLY CHAIN ACTIVITIES				
Authentication and product verification	Creation of quality categories: good condition, very good condition, never worn Price adjustment if necessary	Improved competences and formalization of different quality inspection processes	Development of algorithms to support inspection	Product authentication and control partly outsourced to expert sellers
Remanufacturing and packaging	Development of a brand-new packaging to go beyond the product's history	Repair of minor product defects: scratches, missing buttons...	Seals applied to products to prevent employees wearing them	Product labelling including the name of the quality controller
Development of specific SC knowledge	VC hired people from auction houses, brands, and passionate amateurs Processes formalized e.g. "How to check a Chanel bag?"	Index cards (Kanban) to identify all those involved in the operations (reception by, control by...)	Strict replication of French processes in the New York warehouse	Creation of the Vestiaire Academy to disseminate the process
EXTERNAL SUPPLY CHAIN ACTIVITIES				
Transport	Inbound and outbound flows outsourced to French Post Office	Contract with DHL (€8 to route a parcel from anywhere in UK) for Europe	Contract with Fedex for USA (sales in the US and between Europe and US)	Several contracts with different LSPs depending on the zone and the price of the product
Warehouse infrastructure	Apartment of one of the founders, then an apartment in Neuilly (France) 60 m ²	Private mansion in Courbevoie (France) 700 m ²	Warehouse in Paris (1500 m ²) and New York	Warehouses in Tourcoing (2018, 8000 m ²), New York and Singapore Automation in Tourcoing: capacity 10000 products/day
Flow management	Physical flows centralized in the Paris apartment Products scanned to record distinctive marks, sewing points...	Identification of 25 side processes (temporary stock to consolidate several products in one parcel for example)	Physical flows of products sold from the US centralized in New Jersey (Bergen Logistics)	Physical flows of products sold from Asia centralized in Singapore Possibility for expert sellers to ship directly to the buyer

Table 2. Overview of the VC case study

CASE STUDY

Our longitudinal analysis of the case highlights how this C2C product platform has achieved widespread success in just over a decade and become a flagship firm in the sharing economy. One particular reason for this success is the fact that the founders realized very early on that they had to physically monitor the secondhand luxury products sold through the platform and that, over the years, they have developed an operational model in line with this requirement.

The launch of Vestiaire Collective

Vestiaire Collective was launched to enable and organize sales of secondhand luxury goods between consumers. The initial team included web designers, marketers, strategists, and product and supply chain specialists. As the project developed, the team realized that in order to be successful the site would have to control product origin and quality. In this, they took their inspiration from the used car market:

People prefer to buy from a dealer rather than from a private individual, because the car has been checked. That was the starting point: we decided to put a trusted third party between the buyer and the seller. (HF)

However, to launch the website and initiate the first transactions, they needed to make a sufficient quantity of products available online. With this aim, the team collected more than 3000 products from friends and acquaintances and stored them in the apartment of one of the founders:

We collected all the products they had. We photographed everything, so I spent three months taking pictures in my flat. I had two or three thousand items of clothing at home

in boxes that I photographed day after day after day. We were making product sheets and so at the beginning all our stock was in one place. (HF)

In 2009 the site began to generate transactions. In addition to solving technical problems (e.g., the same product sold eight times), the central question facing the team was how much to charge for the products. They introduced a price moderation policy to ensure that products were not listed at too high a price and then developed a pricing algorithm.

The early development of Vestiaire Collective

Gradually, the website took off and the number of transactions increased. VC had to quickly find a new location to store its growing volume of products (about 3400 parcels per day), moving from a 60 m² Paris flat to a 700 m² site in the neighborhood.

Within a few years, this new site was saturated, as shown in the photo below, so the company moved again in 2015 to a 1500 m² site in the 15th district of Paris.



Picture 1: The stock in VC's private mansion in Courbevoie (2013)

The founder in charge of operations had to physically check the products in the warehouse. He gradually designed and developed processes to check the authenticity and quality of products received from customers:

There can be as many as 400 quality control points depending on the type of product. In general, there are at least thirty. And then how do we get two people to agree on what constitutes good condition? We have had five years' experience. Every six months we review our work processes (CJ).

Obviously, recruiting people specialized in evaluating secondhand luxury goods was almost impossible, so VC hired product specialists from luxury firms or auction houses with the required expertise in each brand and type of product:

We recruited people who had done quality control for luxury brands to bring us knowledge. We have hired people with specialist knowledge of leather goods, for example, who knew how to make such products and control them (AC).

Given that the control processes were conducted on site, the operations manager decided to repackage the items as VC products, so as to develop the VC brand and provide proof that the product had been physically checked:

So, I decided to repackage all the products to clean up all the history that they may have because they belonged to someone (...). You feel like you are buying something new (CJ).

As they had the products at hand, VC gradually began to include small repairs and cleaning in its processes. Once more, they recruited people from luxury houses:

We hired people who had worked at Hermès (...). Thanks to these artists, who work with a palette of colors for leather, we were able to find the right color to hide small marks on products (CJ).

The strategic role of supply chain activities in VC's development

Over the years, VC has continued to grow and, according to the founders, one of the key factors of their success is their ability to control their supply chain, which is at the heart of VC's value proposition:

Our operational model, which has been so hard to develop and implement, is our greatest success (CJ).

In other words, I think that VC's value today is that it receives thousands of products from individuals and injects them into a processing circuit with quality control (HF).

This point is precisely what the founders describe as differentiating VC from other platforms such as eBay and its direct competitor, Vinted:

We sometimes remove spots, or repair and relabel items. Thus, we turn secondhand into as-new. This part of the process is very different from our competitors (HF).

This unique model has also been crucial in enabling VC to finance its growth. Like many start-ups in the sharing economy, VC has regularly organized large fundraising events (see Table 1).

The firm systematically organizes warehouse tours for potential investors:

The investors were highly impressed by the product handling and control process, and by the amount of data we collected. Both investors and partners were seduced by the way we combined operations and supply chain management with the world of luxury (HF).

The model reassures customers as well as investors. The website highlights the fact that VC controls the products, enhancing buyers' trust in the platform and in their purchases. In terms of marketing, VC uses operations to convince customers:

The way VC handles the products with caution, with white gloves, and control processes to combat counterfeit goods are essential. Buyers know that we respect the products.

We invite many influencers to observe our operations (AC).

VC has not clung to an immutable operational model since its beginnings. The firm has improved its operations management by professionalizing its processes and adapting them to the context. Recently, the company has allowed approved sellers to ship items worth less than 250 euros directly to buyers and thus reduce transport costs.

VC has shown dynamic capabilities; each generation develops its own strategy (CJ).

VC has also adapted its model by internationalizing, first to the rest of Europe, then to the US, and finally to Asia. They strictly replicate their control processes in these new markets. They use local carriers that can cover the area and show an interest in VC and its innovative model:

Impressed by our processes, DHL France became a partner more than a provider. They wanted to help us grow (HF).

VC's SCM in 2021

At the beginning of 2021, VC became an international company, one of the two leaders in the secondhand market. According to the latest available data, the company, which does not disclose its sales figures, achieves at least €200 million per year, has 11 million customers in more than 50 countries and employs 400 people. Even though they have modified their processes, as previously mentioned, VC continues to centralize product control operations, justifying the average 25% commission that the company takes on each transaction. Figure 1 shows its complete operational process.

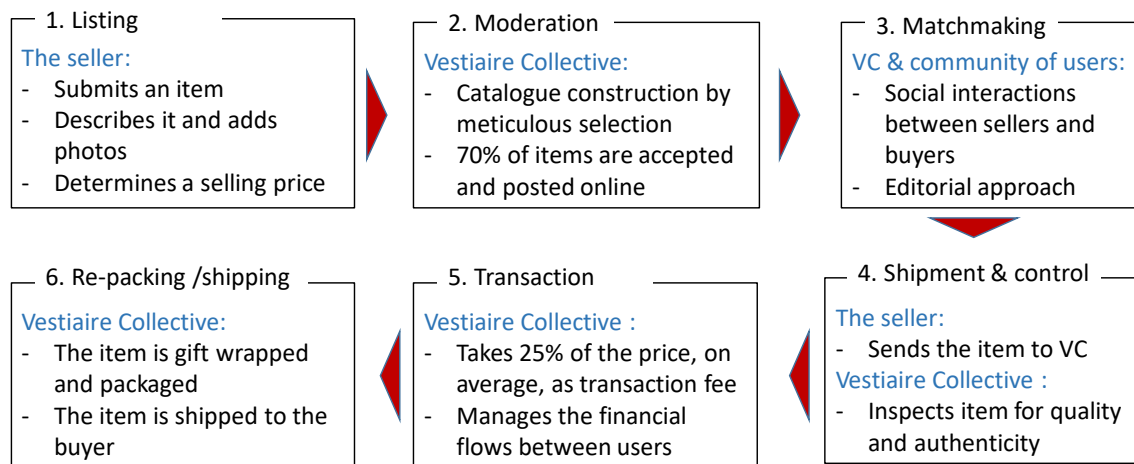


Figure 1. The C2C exchange process (source: Vestiaire Collective).

To enable these exchanges, the company has three logistics centers: New York, Singapore and Tourcoing (northern France). The latter, with a surface area of 8,000 m², replaced the Paris warehouse in 2018. Its layout has been designed in line with VC processes, as shown in the photo below:



Picture 2: The operations in the Tourcoing Warehouse (2019)

Control operations are conducted by teams using tools developed internally over the years. The firm has set up an academy to train its employees in its unique processes. VC has also developed its own information system to track and trace its products. The whole process has been thought out to facilitate shipments between the users. VC's website gives clear shipping instructions to sellers and provides prepaid shipping labels to be sure that the items reach the warehouse. In

addition, they have outsourced all shipments of expensive items (more than €1500) to major couriers (DHL for France, Fedex overseas), while other articles are generally shipped via national postal services. The company also offers delivery to pick-up points.

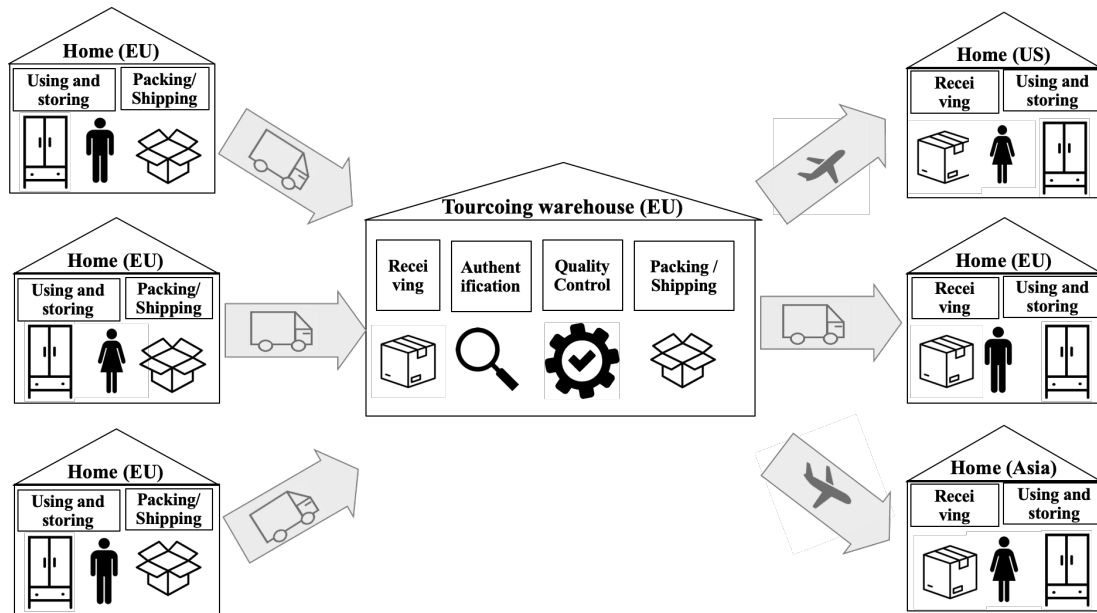


Figure 2. VC supply chain in Europe (source: Vestiaire Collective).

The dynamic analysis of the case clearly shows the structuring role played by the decision to set up a supply chain based on a high degree of physical intermediation. The control and centralization of the physical flows have proven to be: a mechanism for building consumer trust in the products exchanged; a magnet for investors and professional partners; a factor of differentiation from competitors; and a way of attracting talent and generating logistics innovation.

DISCUSSION

Our VC case study makes two main theoretical contributions at the crossroads of the SC and sharing economy literature. Firstly, it illustrates that VC intermediates C2C product exchanges through a supply chain. The VC chain is one form of what we propose to call a “sharing supply chain”, presenting features of both forward and reverse supply chains, as well as specific ones.

Secondly, we characterize the VC model and contrast this extreme case with other types of sharing supply chain to highlight which form of intermediation is the most likely to emerge in sharing supply chains, depending on product features and other variables.

VC, an exemplary sharing supply chain

In the VC case described above, we see that several entities are involved: two individuals (seller and buyer), the logistics service provider (LSP) that handles the physical transfer between the seller and the VC warehouse, the warehouse itself, and the LSP that delivers the item to its destination. VC also involves other organizations (parcel pick-up points, for example). Physical and information flows move between these actors, who handle, inspect, and store items to fulfil customers' requirements. Intuitively, we would call this a supply chain. If we refer to three classic definitions of a supply chain, the VC case fits them perfectly (Table 3). VC's operations can therefore be considered to constitute a supply chain as the firm transfers goods from their point of origin to end customers. We argue that the physical flows of secondhand luxury goods intermediated by VC form a supply chain, which we propose to call a “sharing supply chain”.

Author	Supply chain definition	Vestiaire Collective case
Fisher, 1997 p. 107	A supply chain performs two distinct types of functions: a market mediation function and a physical function	VC operates a market mediation function via its website (and blog) to match the supply and demand of secondhand luxury goods and promote exchanges. It also performs physical mediation by routing the products through its warehouses and undertaking control, authentication, repair, and repackaging operations.
Mentzer <i>et al.</i> , 2001 p. 4	A set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer	In VC's case, well over three entities (seller, LSP, VC warehouse, LSP, buyer) are directly involved in the flows between consumers (sellers and buyers). VC also offers various services (e.g., <i>conciergerie</i> service for pre-positioned storage) and concludes more than 1.5 million transactions a month.
Christopher, 2011 p. 4	A network of connected and interdependent organizations mutually and co-operatively working together to control, manage and improve the flow of materials and information from suppliers to end users	We can easily identify a network of organizations (VC, local postal firms, worldwide integrators) working together to control and manage the flow of secondhand luxury goods and associated information.

Table 3. VC as a supply chain

Specific characteristics of sharing supply chains

In contrast to forward (either manufacturing or service) or reverse supply chains, the members of the sharing chain do not include manufacturers. Sharing supply chains involve consumers (playing the role of seller, customer or both) and two kinds of providers: the matchmaking platform (informational and/or physical), which enables and organizes the exchanges, and logistics service providers. The structure of sharing supply chains thus does not involve as many layers as forward manufacturing chains or PSS chains (Xu *et al.*, 2014). Consumers play a critical role, both triggering and receiving the physical flows orchestrated by the platform, which embodies the customer-supplier duality defined by Sampson (2000). The focal-firm tropism and upstream-downstream links (Mentzer *et al.*, 2001; Christopher, 2011) typical of forward, reverse, and closed loop supply chains are replaced here by a consumer focus and peer-to-peer flow orientation. Sellers in the VC chain can be considered as logisticians (Goudarzi and Rouquet, 2013) insofar as they choose between different transport options (direct shipping or through the platform), select the logistics provider, and arrange for parcel shipment. As shown by the consumer logistics research stream (Granzin and Bahn, 1989), consumers carry out logistics activities and are much more active in sharing chains than in other chains. Moreover, these C2C product exchanges circulate differently: physical flows are not from firms to firms/consumers (forward supply chains), or from consumer/firms to firms (reverse supply chains), but from consumers to consumers (sharing supply chains). Such flows appear to be socially embedded (Granovetter, 1985) and may follow not only an economic but also social and ecological logics. In our case, consumers belong to a substantial community (more than 11 million in 2021) enjoying luxury goods. The abundance of discussions on the platform's blog attests to the reality of this community. Of course, social embedding may be much stronger in other types of C2C product exchanges than among luxury product lovers. This is the case for C2C bartering, donating and lending that occurs between neighbor consumers who explicitly pursue environmental objectives (to prolong product use through better use, for example) and

aim to foster social ties (Martin, 2016; Acquier *et al.*, 2019). Table 4 summarizes the main differences between forward, reverse and sharing supply chains.

		Forward supply chain	Reverse supply chain	Sharing supply chain
Supply chain flows	End points	Firms to consumers	Consumers to firms	Consumers to consumers
	Direction	Forward	Reverse	Lateral
	Products	Finished products	Waste, damaged products, returns	Secondhand products, homemade products
	Dominant logic	Economic	Economic and environmental	Economic, environmental and social
Supply chain structure	Role of individuals	Customer	Supplier	Both customer and supplier
	Number of suppliers	Low to high	High	Potentially infinite
	Number of intermediaries	Low to high	Low	Low
	Number of customers	Low to high	Low	Potentially infinite

Table 4. Forward, reverse, and sharing supply chains

Sharing supply chains and physical intermediation

The supply chain model set up by VC, which consists in centralizing product flows through a warehouse where products are inspected, evaluated, repackaged and where individual orders are duly prepared and expedited, is unique and is not typical of all C2C product exchanges. Adopting a structural contingency perspective (Lawrence and Lorsch, 1967), as applied by Fisher (1997) to forward supply chains, we suggest that different configurations exist, some of which rely on this physical intermediation – like VC – and some which do not. The physical intermediation role played by VC is indeed a response to the specific type of products exchanged. The complexity for consumers to evaluate the quality and authenticity of such products makes it necessary for the platform to act physically as a trusted third party. In the

same way, the importance of brand, authenticity and quality – for both the platform's online rating and its market value – justifies the additional operational costs of setting up and running in-house and central warehouses. Though, as mentioned above, VC has recently introduced direct sales and shipments for products with a lower market value and for sellers whose trustworthiness has already been proven. We can thus infer that the sharing supply chain organization might take different forms (Table 5)

	Physical disintermediation	LSPs physical intermediation	Platform physical intermediation
Degree of physical intermediation	Low	Medium	High
Supply chain members	Consumers + informational matchmaker	Consumers + informational matchmaker + LSP	Consumers + informational and physical matchmaker + LSP
Exchanges involved	Local	From local to worldwide	From local to worldwide
Product price	Low to high	Low to high	High
Complexity of product evaluation	Low to high	Low	High
Complexity of consumer logistics	High	Low	Low
Example	Sale of an IKEA sofa on Le Bon Coin	Sale of an iPhone on eBay	Sale of a Ralph Lauren dress on Vestiaire Collective

Table 5. The continuum of physical intermediation for sharing supply chains

An alternative model is exemplified by the case of eBay, which assists its customers without providing any physical intermediation. In this case, the platform offers support through pre-formatted shipping notes, tracking deliveries, calculating estimated rates according to distance, and guaranteeing payments. Most products are then handled by the country's postal services or specialized LSPs. This type of intermediation can also be found on domestic exchange platforms such as LeBonCoin in France or Craigslist in the US. As these platforms also encourage local exchanges, consumers can meet and pick up the products in person. Handling

over products directly is particularly suitable for heavy, bulky, fragile products with high shipping costs. The question of the physical intermediation of platforms thus seems to vary along a continuum where the extremes would be, at one end, physical intermediation played by the matchmaking platform and, at the other, physical disintermediation, where two individuals meet and the product is handed over in person (Table 5). Just as a company can combine several supply chain strategies (Fisher, 1997) and simultaneously be agile and lean, a single digital platform can integrate several different models, as we have seen for VC.

Product exchange platforms and the supply chain perspective

The VC case demonstrates that physical intermediation is crucial to the success of this C2C product platform. The literature on sharing economy platforms has so far neglected this point. It considers that the success of these platforms is mainly due to being large enough (Evans and Schmalensee, 2010) to benefit from network externalities (Eisenmann *et al.*, 2016) and to gain the trust of users. This ability to act as service facilitator (Kumar *et al.*, 2018) and to generate digital trust (Mazzella *et al.*, 2016) relies on the design of mechanisms that guarantee the reliability of exchanges and thus generate trust between peers and in the platform (Chen *et al.*, 2009). Our results reveal that another way to develop both interpersonal and institutional trust (Belk, 2014; Möhlmann, 2016) – in addition to member rating systems and secure payments, which are widely discussed in the literature – is a strong degree of physical intermediation. This is consistent with Hazée *et al.* (2020) who highlight in the PSS context that some design choices, such as the way of monitoring product location and quality, not only help organizations to reduce operational risks but also enhance consumer-perceived benefits.

Towards a theory of sharing supply chains

Our work defines the sharing supply chains, contrasts them and questions the physical dimension of their intermediation and its importance. At this point, the in-depth exploration of the VC case leads us to formulate several research propositions regarding the factors influencing the

intermediation deployed by the C2C product platform, thus making “precise predictions about relationships” (p. 1245) as recommended by Boer *et al.* (2015) for theory building.

P1: The characteristics of the product influences the intermediation deployed by the C2C product platform in sharing supply chains

P1a: The higher the market value of the product, the higher the probability that the C2C product platform will play a physical intermediation role

P1b: The greater the complexity of product evaluation, the higher the probability that the C2C product platform will play a physical intermediation role

P1c: The higher the degree of the needed intervention on the product, the higher the probability that the C2C product platform will play a physical intermediation role

P2: Over time, the characteristics of the seller influence the intermediation deployed by the C2C product platform in sharing supply chains

P2a: The higher the number of transactions of the seller, the lower the probability that the C2C platform will continue playing a physical intermediation role

P2b: The higher the sellers’ rating by customers, the lower the probability that the C2C platform will continue playing a physical intermediation role

Our research explored, on a conceptual level, the C2C supply chains in a “theory generation” approach (Ketokivi and Choi, 2014). Our results are in line with what can be described as mid-range theory in the sense that they make general predictions within a given context (Boer *et al.*, 2015). Confirming the important role of case studies in OM and SCM, our work defines sharing supply chains around several characteristic variables, in the field of peer-to-peer product exchanges; specifies the relationships they have with other types of supply chains; offers predictions formulated as propositions. These contributions can thus be considered in

the sense of Voss et al. (2002) as presenting the 4 components making up a theory in operations management.

CONCLUSION

In this research, we have inductively studied an extreme case to develop a first conceptualization of the sharing supply chain. We have highlighted the characteristics of these sharing supply chains and contrasted them with forward and reverse chains. We then identified the main variables that may generate different forms of sharing supply chains (Brun *et al.*, 2017) and developed several research propositions. At the same time, our in-depth case study and its findings contribute to the scarce supply chain literature on the luxury industry (Shen *et al.*, 2020). The whole research process leads to a set of managerial implications.

Managerial implications

In a world where circular initiatives will be increasingly necessary, sharing supply chains are set to grow. By defining and contrasting them, our work highlights their specificities and the choices they present to entrepreneurs. Moreover, by providing a “thick description” of a successful C2C product platform, we reveal important insights on the managerial work to design and implement the adequate supply chains to support such type of initiative. This could enlighten other entrepreneurs in similar fields. In particular, by uncovering the different key success factors leading to VC success across time, we show the need for systemic coherence between strategic and operational activities, namely supply chain ones. We point out that these initiatives may require more than digital skills and resources. Although the digital platform plays a key role in organizing the intermediation between actors, many non-digital assets and supply chain capabilities are needed to achieve sustainable results. As we pointed out earlier, these sharing supply chains are deployed between consumers. Our research thus contributes to consumer logistics by showing that the consumer's logistical involvement is necessarily linked to the platform's operational choices and should therefore be understood.

Validity of the research

However, our exploratory study has several limitations related to its validity, which suggest avenues for future research. First, the internal validity of our research is limited. Although we collected data in several stages, we interviewed the founders of VC some years after they launched the company. This has drawbacks: actors may overlook important elements or emphasize others which are less relevant; they may also make ex post rationalizations. From this perspective, it would be valuable to deploy a participant observation approach in a start-up that is currently trying to develop C2C product exchanges. Second, in analyzing a single exemplary case, the external validity of our research is by its very nature limited. To strengthen this preliminary theory-building effort, we need to build on the uniqueness, fecundity and integration (Wacker, 1998) of our work. Other C2C product platforms could be studied to deepen our understanding of their distinctive features, to refine this "new construct that can have a broader appeal" (Choi and Wacker, 2011, p.10), and delineate its boundaries clearly. We probably also need to connect multiple theories to fulfil the "integration" criterion of good theory-building practice (Wacker, 1998). Advances in SC knowledge that accompanied the development of supply chains during the 1990s and the first decade of the new century (MacCarthy and Atthirawong, 2003) led to significant improvements and professionalization in terms of location decisions, outsourcing strategies, the level of integration between players, and optimization of costs and lead times (Meixell and Gargeya, 2005). However, these new considerations may not be relevant when managing sharing supply chains (direct, socially embedded, etc.). What criteria should be considered when designing and managing emergent sharing supply chains, in terms of the installation and allocation of physical assets, and of the organization and role sharing between actors? Which features will form the basis for effective supply chain management of C2C product exchanges?

Labelling a product exchange system as a supply chain

Our research raises the question of when a product flow can really be called a supply chain. If VC's flows can be considered a supply chain, can all physical product exchange systems be conceptualized as such? For instance, can the physical flow generated by the loan of a physical good – say a drill or a chair – between two neighbors be considered a supply chain? As highlighted by Rouquet *et al.* (2018), such consumer-to-consumer exchanges are often one-shot, elementary (involving few actors), direct, and not market-oriented. However, the absence of a monetary transaction – a common feature of peer-to-peer relations – is not conclusive, as supply chain approaches have been used for years in non-market settings, such as humanitarian or military contexts. Nor is the one-off/ad hoc nature of these exchanges, as scholars have recognized and studied temporary or ephemeral supply chains in contexts such as construction, events management, etc. Finally, the number of actors and system complexity may not provide a clear answer either. As stated above, Mentzer *et al.* (2001, p. 4) define a supply chain as "a set of three or more entities (organizations or individuals)", while Chopra and Meindl (2001) evoke a series of cycles, each performed at the interface between two stages. Moreover, some authors consider supply chains to be complex networks (Christopher and Peck, 2004), linking organizations, industries and economies (Harland *et al.*, 2001). These observations raise the following questions: What features might be considered essential for a supply chain? What criteria should be used to define a supply chain? Can a product exchange involving only two actors be described as a supply chain? Is a minimum degree of complexity and management required? Or can we follow Mentzer *et al.* (2001) in considering that supply chains exist whether they are managed or not?

Relationships between sharing supply chains and other supply chains

Our research suggests the importance of supply chain strategies for developing consumers' trust and proposes that different levels of physical intermediation might be appropriate. Both results could be considered by matchmakers when designing their own chains. But C2C product

exchanges also have an impact on other organizations. Just as the identification of reverse supply chains (Stock, 1992) generated questions about their connections with forward chains, resulting in the notion of a closed loop supply chain (Guide *et al.*, 2003), the identification of sharing supply chains indeed raises the question of their connection with other chains. They appear to overlap in several ways. Sharing chains for the donation, reuse and resale of goods can be seen as another form of reverse chain organized in a distributed mode, giving rise to new brokerage roles for the development of circular business models (Ciulli *et al.*, 2019; Lüdeke-Freund *et al.*, 2019). How do sharing SCs affect product design, if a manufacturer wishes to consider multiple use cycles? What about the possible connections between forward and sharing supply chains? Some retailers, such as Decathlon and IKEA, have set up dedicated sharing platforms for consumers to resell their products to others (Acquier *et al.*, 2019; Rouquet *et al.*, 2018). Is this intertwining between chains going to spread further? How is it going to affect SC design decisions and business models?

The environmental impact of sharing supply chains

At first glance, sharing supply chains can be seen as the missing link for the development of a circular economy and consequently as having a positive environmental impact. Several studies have shown, however, that the claimed positive impacts of the sharing economy, notably those concerning the environment, are debatable (Murillo *et al.*, 2017). By facilitating product exchanges between consumers, some of these flows encourage a rise in consumerism and faster product turnover, as consumers can more easily replace items with newer models (Parguel *et al.*, 2017). Sharing SCs, which materialize the flows generated by C2C product platforms, may even have an adverse environmental impact: intermediaries like VC facilitate international exchanges, which generate high emissions due to the long distances. How do the various motivations of those participating in the sharing economy and hence generating sharing SCs disrupt traditional, sustainable supply chain standards? What new performance criteria (beyond

the traditional cost-time-quality triangle) will be needed to manage these chains? What are the positive and negative externalities of sharing supply chains in their different configurations and geographic coverage? Specifically, what are the differences between purely physical, local sharing chains and chains with informational and/or physical intermediation operated by a digital platform such as VC? A configurational approach that builds typologies of sharing chains might be useful to assess their societal and environmental impact.

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